

CLAIM

1. A chemical sensor for detecting a reaction of  
a sensor material with a specimen on the basis of an  
5 intensity of a surface plasmon polariton wave  
propagated along a surface of a sensor medium  
comprising the sensor material, said chemical sensor  
comprising the sensor medium,

wherein said sensor medium comprises a  
10 periodic structure and the sensor material disposed on  
the periodic structure, the periodic structure having  
a pitch substantially equal to an integral multiple of  
a wavelength of the surface plasma polariton wave  
generated by irradiating an interface between the  
15 periodic structure and the sensor material with light.

2. A sensor according to Claim 1, wherein the  
sensor material is a biochemical sensor material.

20 3. A sensor according to Claim 1, wherein the  
periodic structure comprises a plurality of openings  
provided in a metal film with a predetermined pitch,  
the openings having a size smaller than a wavelength  
of the irradiation light.

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4. A sensor according to Claim 3, wherein the  
openings have a substantially circular shape or a

substantially polygonal shape, and their periodic arrangement is a two-dimensional arrangement in the metal film surface.

5           5.    A sensor according to Claim 3, wherein the openings have a slit shape, and their periodic arrangement is a one-dimensional arrangement in the metal film surface.

10           6.    A sensor according to Claim 5, wherein the openings having a slit-like shape includes adjacent two openings sandwiching a metal film portion having a length of circumference which is a substantially integral multiple of a wavelength of the surface  
15 plasmon polariton wave.

            7.    A sensor according to Claim 3, wherein the periodic structure comprising a plurality of openings provided in a metal film with a predetermined pitch is  
20 provided in a plurality of periodic structures which have the same or different sizes and/or pitches of their openings and the same or different arrangement directions.

25           8.    A sensor according to Claim 1, wherein the periodic structure comprises at least one opening provided in a metal film with a predetermined pitch

and at least one recess portion or projection portion provided in the metal film, the opening having a size which is smaller than a wavelength of the irradiation light.

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9. A sensor according to Claim 8, wherein the opening and the recess portion or the projection portion has a substantially circular shape or a substantially polygonal shape, and their periodic  
10 arrangements are a two-dimensional arrangement.

10. A sensor according to Claim 9, wherein the two-dimensional arrangement is such an arrangement that the recess portion or the projection portion is  
15 disposed concentrically around the opening.

11. A sensor according to Claim 8, wherein the opening and the recess portion or the projection portion has a slit-like shape, and their periodic  
20 arrangements are a one-dimensional arrangement.

12. A sensor according to Claim 8, wherein the opening includes adjacent two openings sandwiching a metal film portion having a length of circumference  
25 which is a substantially integral multiple of a wavelength of the surface plasmon polariton wave.

13. A sensor according to Claim 3, wherein the metal film is a film of a metal or alloy selected from the group consisting of gold, silver, copper, and aluminum.

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14. A sensor according to Claim 1, wherein the periodic structure comprises fine metal particles disposed on a substrate with a predetermined pitch, the fine metal particles having a size which is  
10 smaller than a wavelength of the surface plasmon polariton wave.

15. A sensor according to Claim 14, wherein the fine metal particles have a length of circumference  
15 which is a substantially integral multiple of a wavelength of the surface plasmon polariton wave.

16. A sensor according to Claim 1, wherein the sensor medium comprises the periodic structure and a  
20 substrate for the sensor material disposed on the periodic structure, the substrate comprising a prism.

17. A sensor apparatus, comprising:  
a chemical sensor according to any one of  
25 Claims 1 - 16,  
a light source for irradiating the chemical sensor with light, and

a photodetector for detecting light transmitted through or reflected from the chemical sensor.

5        18. An apparatus according to Claim 17, wherein the photodetector comprises a spectroscope.

19. An apparatus according to Claim 18, wherein the photodetector comprises means for detecting light  
10 transmitted through a band-pass filter.

20. An apparatus according to Claim 17, wherein the sensor medium is integrally supported in a micro total analysis system prepared through a semiconductor  
15 process.

21. An apparatus according to Claim 17, wherein the sensor medium is integrally supported in a DNA chip prepared through a semiconductor process.  
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22. An apparatus according to Claim 17, wherein the sensor medium is integrally supported in a protein chip prepared through a semiconductor process.  
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